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(58) Field of search
D1K

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(54) Packing material

(57) Packing material for use as a packing or gasket comprises in combination braided strands 31,32 of vitreous fibres (glass ceramic or quartz) and braided strands 33 of fibres which may be organic fibres from the group (P.T.F.E., polyethylene, polypropylene, aramid, nylon, rayon, flax, ramie, hemp, jute, cotton) or carbon or graphite fibres. The fibres may form separate strands braided together as shown, may be combined within each braided strand or may be braided into separate sleeves one within the other. A central core of inexpensive organic fibres may be provided. The material is preferably impregnated with a lubricant which may consist of dispersed graphite, MoS_2, TiS_2, WS_2, mica or talc together with a binder in the form of P.T.F.E. or starch or which may be P.T.F.E. itself.

FIG. 4

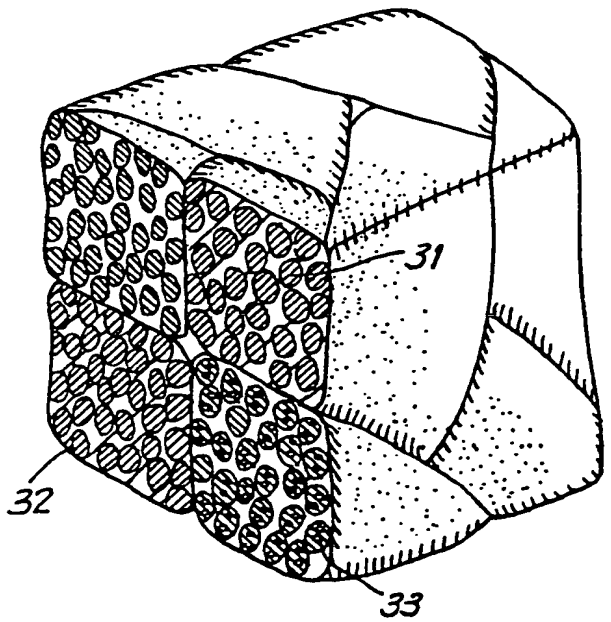

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FIG.1

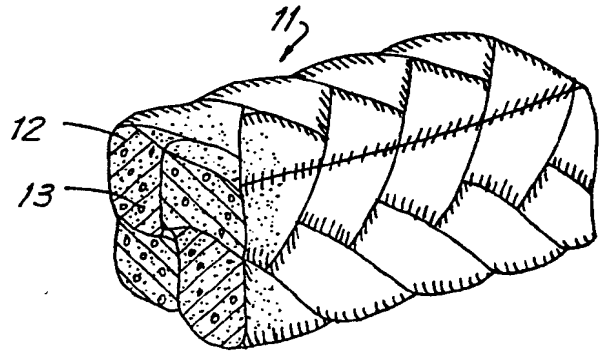

FIG.2

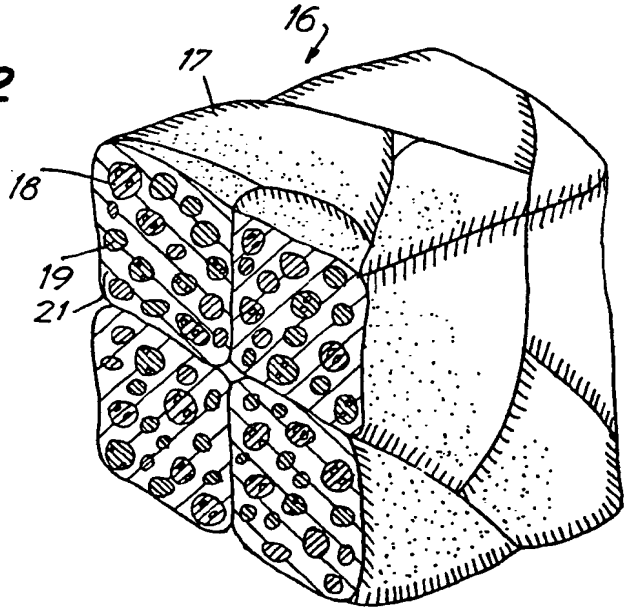

FIG.3

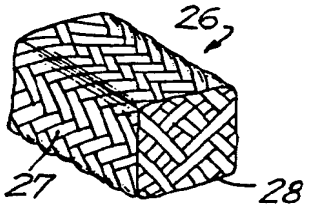

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FIG. 4

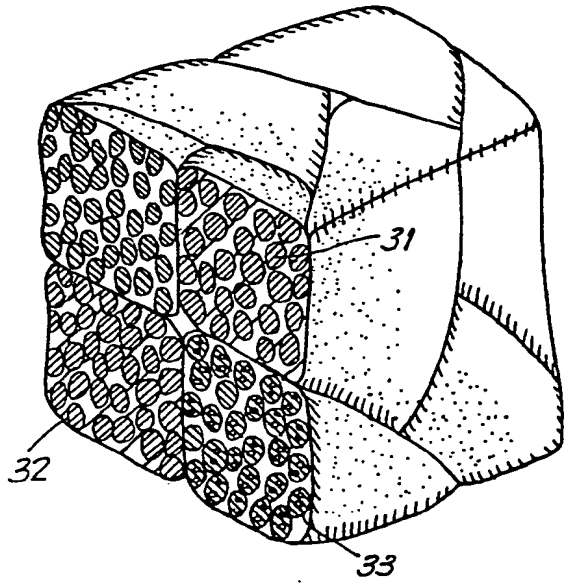

FIG. 5

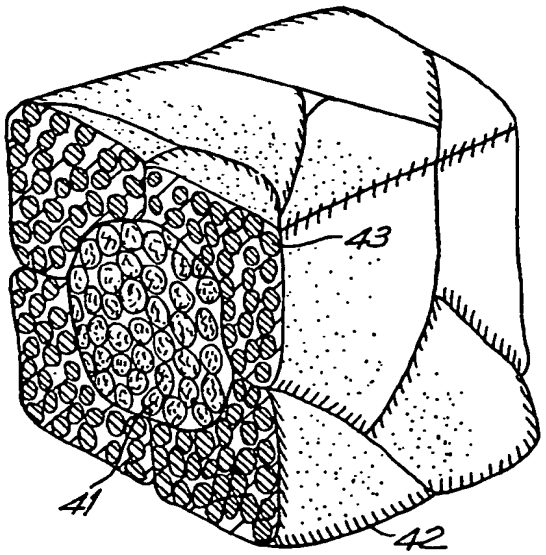

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FIG.6a

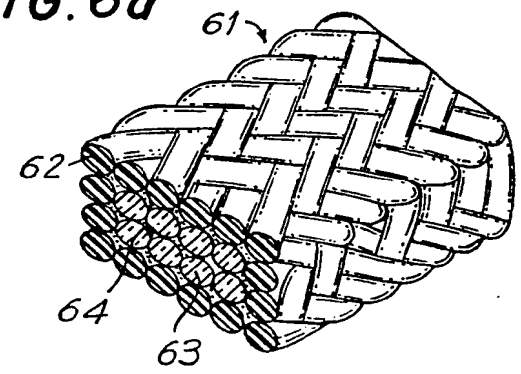
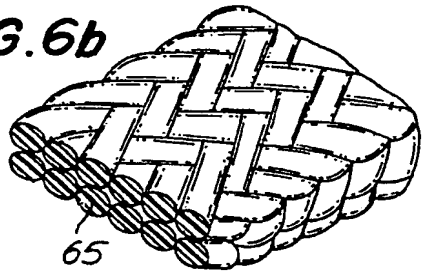


FIG.6b



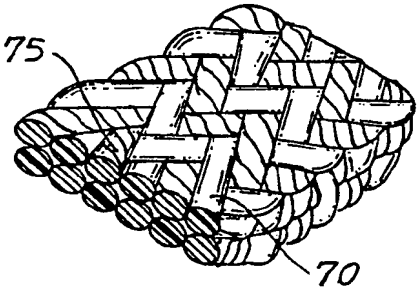


FIG.6c

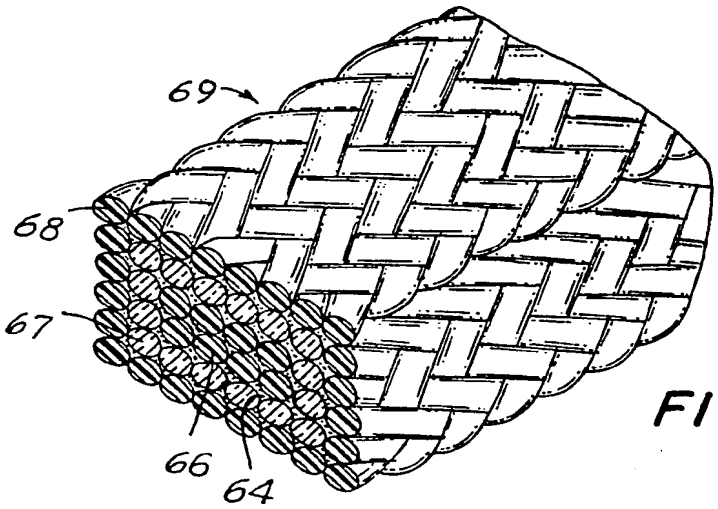


FIG.7

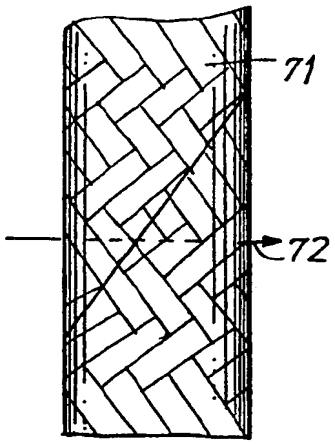


FIG.8

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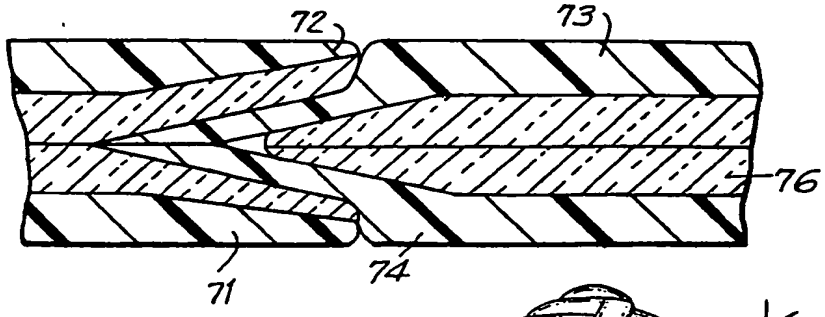


FIG.9

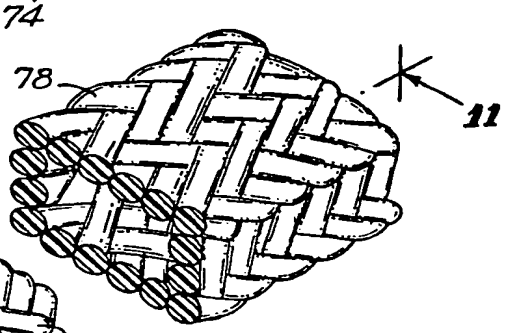


FIG.10

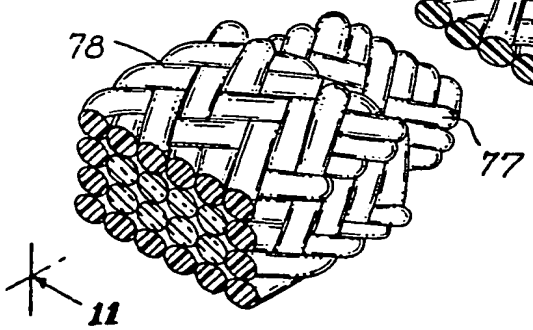


FIG.11

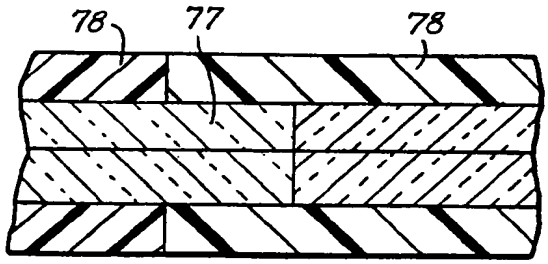
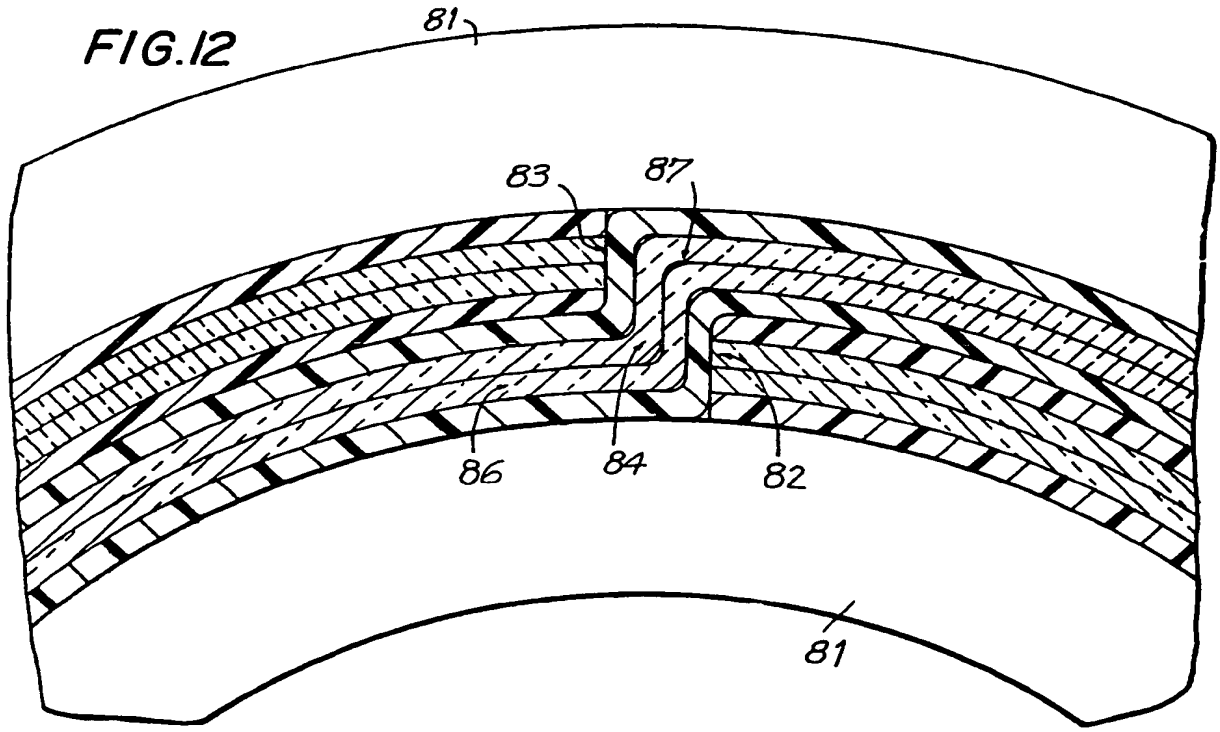


FIG.12



SPECIFICATION

Packing material

This invention relates to packing material.

Polytetrafluoroethylene (TFE) in the form of a dispersion or a fiber has been used in packings and in gasketings in conjunction with glass fibers, and with lubricants other than the TFE fiber itself. The TFE fibers possess the property of cold-flow, advantageous for conforming to the shape of a container but disadvantageous where the container is not shaped to retain the packing. The fiber also has a low coefficient of friction, valuable for operation in contact with moving components. The dispersion acts as a lubricant so that fibers such as those of glass and graphite may function as packing material also in contact with moving components, provided the lubricant is retained.

In addition to the aforenoted properties, we have discovered that these TFE materials possess unexpected and highly advantageous properties when combined with other fibers and other lubricants as will be described herein. These properties make it possible for embodiments of the invention to replace packing and gasketings based on asbestos, known to be carcinogenic, at competitive prices and to function in many environments previously restricted to compositions containing extremely expensive materials such as graphite fibers.

A known combination of glass fibers with TFE fibers has a central core of glass fibers with a jacket of TFE fibers. While such a structure can be suitable for a wide variety of purposes, nevertheless it can suffer from excessive cold flow since the TFE is not sufficiently constrained by the glass fiber core. The present invention is concerned with the broader field of vitreous fibers together with known and new organic fibers in structures which reflect the advantages of both types of fibers. It is also concerned with the use of vitreous fibers alone when lubricated with a dispersed inorganic material held in place by dispersed TFE.

The search for non-asbestos fluid sealing materials has led to the development of packings and gaskets composed of fiber, aramid fiber, graphite and carbon fiber, used individually. While these all function well for some purposes, each of these can be improved significantly for the same or other purposes by being combined in a braided or twisted structure, or a combination thereof, with fiber glass; also a braided or twisted structure of fiber glass without other fiber, if properly lubricated, is useful for certain purposes, but is significantly improved by the admixture of a quantity of TFE, aramid, polyethylene, polypropylene, nylon, rayon, vegetable, graphite or carbon fibers for other purposes.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the invention, reference is had to the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a cross-section perspective view of a packing of the present invention;

Figure 2 is a similar view of an embodiment including both organic and vitreous fibers;

Figure 3 is a similar view of a packing of the present invention in a cross-lock construction;

Figure 4 is a similar view of an embodiment in which strands of vitreous fiber are combined with strands of organic fiber;

Figure 5 is a similar view of an embodiment including a jacket of vitreous fiber over a core of organic fiber;

Figure 6a is a perspective view of a cut end of gasket material of the present invention;

Figure 6b is a perspective view of a cut end of another embodiment in the form of a single sleeve, strands in said sleeve including both vitreous and organic fibers, twisted, spun or laid up together;

Figure 6c is a perspective view of a cut end of yet another embodiment in the form of a single sleeve wherein individual strands are either of vitreous fiber or organic fiber, both types of fiber being present in the sleeve;

Figure 7 is a perspective view of a cut end of another embodiment of the invention;

Figure 8 illustrates a method of joining the ends of a gasket of the present invention;

Figure 9 is a sectional view of a gasket of the present invention;

Figure 10 is an exploded view in perspective of a gasket of the present invention;

Figure 11 is a view taken along line 6–6 of Fig. 5; and

Figure 12 is a partial sectional view of another gasket of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A braided packing in accordance with the present invention is shown generally in Fig. 1 by the reference numeral 11. The braided material is a vitreous fiber, suitable vitreous fibers being of glass, ceramic or quartz, glass fibers being preferred because of lower cost. Glass fibers are available in electrical, structural or chemical grades. A specific fiber to be used is selected on the basis of chemical resistance, the maximum temperature to which the packing is to be exposed and cost. Texturized inorganic fibers increase product bulk and resilience.

The vitreous fibers 12 possesses the necessary resilience to conform generally to the interior of a stuffing box and the exterior of a shaft and when used without organic fiber must be impregnated with an appropriate material 13 to provide an effective seal as well as lubricant. In a patent issued to one of us

(U.S. Patent No. 3,306,155) a construction in which TFE dispersion was used as the impregnant was disclosed. However, the cost of the TFE dispersion is such that the resultant packing is substantially more expensive than the graphited asbestos packing which it was designed to replace. An attempt was made to replace the TFE dispersion in a fiber glass packing or gasketing with graphite dispersion, but the graphite dispersion is easily displaced from the vitreous fiber by liquid, even at low pressure so that such a composition has little value. However, we have found that the addition of even as little as 5 wt % of TFE dispersion or starch as binder suffices to retain the graphite within the fiber glass gasketing. The content of dispersed TFE or starch in an impregnant may be as low as 5 weight % and may be as high as 50 weight % with dispersed graphite, molybdenum, tungsten or titanium disulfide, mica or talc constituting the actual lubricant. For the optimum combination of performance and cost, the content of dispersed graphite or other inorganic lubricant should be between 60 and 90 weight % with the TFE dispersion at 40 to 10 weight %. It has been found that graphite is retained so completely in the fiber glass packing by the TFE dispersion even at a level of 5% TFE that the packing can be handled without soiling the hands as with ordinary graphited packings. It is therefore evident that the TFE is functioning as a binder rather than as a lubricant since at the 5% level the dispersed TFE can provide only negligible lubrication.

Starch has been found to be effective as a replacement for TFE in retaining the inorganic lubricants in packing. However, starch can be used only in connection with nonaqueous solvents or solutions, since it is sensitive to water.

Under certain circumstances, such as when a packing is used to seal a reciprocating shaft rather than a rotating shaft, or where excessive compressive force is applied during installation or subsequent adjustment, unprotected glass fibers may be broken relatively readily as the result of glass-to-glass impingement. In such circumstances, where abrasion constitutes a serious problem, it is beneficial to incorporate organic fiber with the vitreous fiber. Suitable organic materials are TFE fiber, aramid, sold under the trade name of "Kevlar" by duPont, nylon, rayon, polyethylene, polypropylene, carbon and graphite fibers. Vegetable fibers such as flax, jute, cotton, hemp, rayon and ramie are also useful in certain applications. Addition of as little as 5 weight % of TFE fiber to 95 weight % of vitreous fiber facilitates the braiding of the materials and substantially reduces abrasion, apparently by reducing the number of glass-to-glass contacts. The content of the organic fiber in the combination is held to a minimum because of the cost thereof.

Such packing (containing at least 5% of organic fiber with the glass fiber) may function effectively without any lubricant, but preferably is lubricated. Since the organic fiber helps to hold the lubricant, the composition of the lubricant may range from 100% inorganic to 100% organic. The addition of a suitable lubricant as disclosed herein, under the compressive force of gland pressure incidental to the istallation or subsequent adjustment of the packing, also serves to mitigate glass-to-glass contacts, thus contributing to prevention of self-abrasion of vitreous fibers in addition to functioning as sealant and lubricant.

A packing based on the combination of a vitreous fiber with an organic fiber is shown in Fig. 2, in which a braided structure is indicated generally by the reference numeral 16. Each of the strands 17 comprises vitreous fibers 18 and organic fibers 19. The vitreous and organic fibers may be laid up together, twisted together or spun together; the space between the fibers is filled with impregnant 21, which may be a dispersed inorganic material such as graphite or a metal disulphide or mica or talc, either alone or in combination with an organic dispersion such as TFE or starch, or th impregnant may be an organic dispersion alone. It should be noted that an organic fiber will retain an inorganic lubricant even in the absence of an organic binder.

For long life of structures containing both vitreous and organic fibers at reasonable cost, the organic fiber content is preferably from 5 to 55 weight % of the total fiber content. For optimum cast-effectiveness, the organic fiber content is from 10 to 35 weight % of the total fiber content. The preferred vitreous fiber is glass fiber. The preferred organic fiber so fas as conformability is concerned is TFE fiber. The preferred inorganic lubricant, on the basis of expense, is graphite, generally available as an aqueous dispersion. TFE dispersion is used with an inorganic lubricant primarily as a binder, but where used in excess of about 5 weight %, also functions as a lubricant.

Where the vitreous fiber is glass fiber and the organic fiber is TFE fiber, the content of organic fiber in such a combination may be from 5 weight % to 95 weight %. The preferred inorganic fiber content is from 45 to 95 weight % for cost saving and from 65 to 90 weight % for the optimum combination of cost and performance. Where the fiber combination is lubricated with dispersed graphite combined with dispersed TFE, the content of dispersed graphite in the dispersed material is from 50 weight % to 95 weight %. However, the content of dispersed graphite should preferably be between 60 and 90 weight % to provide the optimum combination of performance and cost saving.

Where graphite is present as a lubricant, corrosion of the metals in contact with the packing may result. In such circumstance a

minor quantity of powdered zinc is added as a corrosion inhibitor.

In the embodiment of Fig. 3 a packing 26 in braided cross-lock construction is shown. The diagonal construction is shown at cut end 28. Each of the strands 27 comprises a vitreous and an organic fiber.

In the embodiment shown in Fig. 4, strands 31 and 32 consist essentially of vitreous fibers and strands 33 and 34 consist esentially or organic fibers, suitable vitreous and organic fibers being those aforenoted. The packing is impregnated with a lubricant and a binder as aforenoted in connection with construction in which each individual strand includes both inorganic and organic fiber. For specific applications a packing in which each strand consists of only one type of fiber may be found to outperform a packing in which each strand contains both vitreous and organic fibers.

In the embodiment shown in Fig. 5, a core 41 of a relatively inexpensive organic fiber is covered with a braided jacket 42 of vitreous fiber 43 which may contain from 2 to 50 weight % of a more expensive fiber such as aramid. Where aramid is present in the jacket, the glass and aramid fibers may be twisted, spun or laid up together. Also, strands of glass fiber may be braided together with strands of aramid. The packing is lubricated with a dispersed inorganic material such as graphite, MoS_2, TiS_2, WS_2, talc or mica in combination with dispersed TFE or starch as binder, the combined dispersions being indicated by the reference numerals 93. The vitreous fiber may be of electrical, structural or chemical glass and the organic fibre of the core is of a relative in expensive material such as polyethylene, polypropylene, hemp, jute, flax, cotton, rayon, nylon or ramie (the ramie being useful only if the cost is low enough). The organic fiber of the core may be spun, twisted, laid up or braided and Fig. 5 is to be regarded as showing the organic fiber in any of these constructions. The ratio of inorganic lubricant to organic binder is from 50:50 to 95:5 by weight with the preferred range being 60:40 to 90:10 by weight. The ratio of the jacket weight to that of the organic fiber in the core may range from 10:90 to 90:10 depending upon the service and the relative costs of the materials, but is preferably from 20:80 to 80:20.

The requirements for gasketing to be used in applications in which the gasket material is not subject to abrasion by moving components are somewhat similar to the requirements for packing which must maintain a seal when in contact with moving components. Thus, resistance to a variety of chemicals as well as suitability for operation at relatively high temperatures are important characteristics in both packings and gasketings. However, the relatively rapid cold flow of TFE fiber which is so desirable in a packing can lead to failure since gasketings are not generally totally enclosed. Here the value of the combination of organic fiber with a glass fiber and a sealant becomes evident once more.

As aforenoted, the presence of a core of glass fiber within a jacket of TFE fiber is not sufficient to prevent excessive cold flow in the jacket. To reinforce the TFE fiber, glass or other vitreous fiber must be interbraided therewith or must make contact therewith in relatively thin sleeves.

A gasket material of the present invention is indicated generally by the reference numeral 61 in Fig. 6a, said gasket material comprising a braided outer sleeve of organic fiber 62 surrounding a base sleeve of vitreous fiber 63, said base sleeve also being braided. It is the combination of vitreous fiber with organic fiber which makes it possible to use the organic fibers over an extended range of conditions. Gasket material 61 is impregnated with dispersed TFE which is subsequently dried.

Suitable organic fibers are TFE, aramid, polyethylene, polypropylene and nylon, TFE and aramid being preferred. Suitable vitreous fibers are chemical, structural and electrical grade glass fiber, ceramic and quartz, chemical grade glass fiber being preferred because of its greater resistance to attack by chemicals. The impregnant is indicated by the reference numeral 64, the preferred impregnant being dispersed TFE. However, starch can be used where the fluid to be retained in nonaqueous.

In the manufacture of the embodiment of Fig. 6a, vitreous fiber 63 is first braided and then organic fiber 62 is braided over the vitreous fiber (braid-over-braid). The weight ratio of inorganic fiber to organic fiber may lie within 5:95 and 95:5 but preferably lies between 20:80 and 80:20. After braiding, the material is calendered into rectangular section. The glass fiber braid makes contact with organic fiber over the entire area thereof, thereby providing the restraint needed.

In the manufacture of the embodiment of Fig. 6b inorganic and organic fibers are twisted or spun or laid up together to form yarn of strands 65 and these are then braided into one or more sleeves. In the gasket of Fig. 6b only one sleeve is shown. The number of sleeves may be as great as is needed for the particular application. In general the weight of each component may lie between 5% and 95% but preferably lies between 10% and 90%. The impregnant is preferably dispersed TFE.

In the manufacture of the embodiment of Fig. 6c some strands 70 contain only inorganic fibers and other strands 75 contain only organic fibers. Again, as in Fig. 6b only a single sleeve is shown, but the gasket may be of any desired number of sleeves, one over

the other. Also, in the construction of Fig. 6b, a single strand may contain both inorganic and organic fibers.

The embodiment of Fig. 7 is a modification of that of Fig. 6a. In the embodiment of Fig. 7, an inner sleeve of organic fibers 66 is first formed by braiding, after which a base sleeve of vitreous fiber 67 is braided over the inner sleeve and, finally, an outer sleeve of organic fiber 68 is braided over the base sleeve of vitreous fiber 67. The gasket material indicated generally by the reference numeral 69 is impregnated, preferably with TFE dispersion and dried at any stage of the manufacture.

In preparing the gasket material for sealing the cover of a pressure vessel to the vessel itself or for sealing lengths of pipe together, the gasket material must be cut. Where the cut is perpendicular to the general direction of the gasket, fluid pressure may displace the gasket in a direction lateral to the gasket itself. To prevent this, the gasket should be cut so that resistance to fluid pressure is provided by the vitreous fiber. As shown in Fig. 8, gasket material 71 is cut diagonally so that fluid pressure in the direction indicated by the arrow 72 is resisted by both the organic and the vitreous fiber, the major portion of the resistance to displacement or cold flow being provided by the vitreous fiber.

Another means of preparing the cut ends of the gasket material is illustrated in Fig. 9. To prepare the construction shown in Fig. 9, end 72 of gasket material 71 is first opened up, the braided structure making this possible. End 73 of the gasket material is then inserted into the open end 72. When pressure is applied by the flanges (not shown) being sealed together, the organic fibers 74 and inorganic fibers 76 deform as indicated in Fig. 9 to achieve an arrangement in which the vitreous fibers 76 in the cut ends interpenetrate each other and thereby reinforce the cut ends against the fluid pressure.

Yet another embodiment is shown in Figs. 10 and 11, Fig. 10 showing in perspective a tongue-and-groove arrangement in which the tongue includes vitreous fibers for reinforcing the organic fibers at the other end of the gasket. The interior construction is shown in section in Fig. 11, the vitreous fibers being indicated by the reference numeral 77 and the organic fibers being indicated by the reference numeral 78.

As is evident, all of the above constructions can be applied to any of the described gasketing materials.

As the result of the reinforcement provided by the vitreous fiber, especially when the ends are shaped as indicated herein, pressures as high as 400 psi at 250°F and 60 psi at 450°F can be retained. By combining these materials, the strength of the vitreous fiber, which causes difficulties when used by itself, is tempered by the soft, cushioning, filling effect of the organic fiber. Similarly, where the softness of the organic fiber is the limiting factor when used alone, it is strengthened and controlled by the use of the vitreous fiber. Finally, the combination of TFE fiber, glass fiber and TFE dispersion completely eliminates the problem of sticking to the metal flanges such as are shown in Fig. 12. In the construction shown in Fig. 12, metal flanges as on a cover and body of a vessel are indicated by the reference numeral 81. The gasket material is cut with square edges, but the length of the gasket material is such that it can form two turns around the vessel, the two turns being in the form of a spiral. The cut ends of the gasket are indicated by the reference numerals 82 and 83, and the length of the gasket material cut is such that it is long enough to lie around the joint as shown in Fig. 12. As pressure is applied to the two coils of the gasket, the gasket material is bent or deformed as shown at 84. Displacement of the gasket at cut end 82, for instance, is prevented by the reinforcement provided by the vitreous fiber at 86 in the lower turn of the gasket. Similarly, displacement of the cut end 83 is prevented by the reinforcement provided by the vitreous fibers at point 87 in the upper layer of the gasket material.

The relative thicknesses of the vitreous fiber layer and the organic fiber layer are selected in accordance with the degree of reinforcement and the degree of conformability desired.

CLAIMS

1. Packing, comprising braided strands of vitreous fiber and organic fiber in combination, said vitreous fiber being selected from the group consisting of electrical-grade glass, structural-grade glass, chemical-grade glass, ceramic and quartz fibers, said organic fiber being selected from the group consisting of polytetrafluoroethylene (TFE), polyethylene, polypropylene, aramid, nylon, rayon, flax, ramie, hemp, jute, cotton, carbon and graphite fibers, the content of vitreous fiber in said combination being from 5 to 95 weight %.

2. Packing as claimed in claim 1, wherein said organic fiber content is from 5 to 55 weight %.

3. Packing as claimed in claim 1, wherein each of said strands consist of vitreous and organic fibers in combination.

4. Packing as claimed in claim 1, wherein said packing comprises first strands consisting of vitreous fibers and second strands consisting of organic fibers said strands being braided together.

5. Packing as claimed in claim 1, further comprising an inorganic lubricant selected from the group consisting of dispersed graphite, MoS_2, TiS_2, WS_2, mica, talc and combinations thereof and a binder of TFE dispersion or starch in combination with said inorganic lu-

bricant.

6. Packing as claimed in claim 5, wherein said lubricant is dispersed graphite and said binder is dispersed TFE.

7. Packing as claimed in claim 6, wherein the content of graphite in said combination is from 60 to 90 weight %.

8. Packing as claimed in claim 1, further comprising an impregnant consisting essentially of 0 to 100% dispersed TFE, the remainder being dispersed graphite.

9. Packing, comprising braided vitreous fiber, and impregnant, said impregnant comprising 50 weight % to 95 weight % of an inorganic lubricant selected from the group consisting of dispersed graphite, MoS_2, TiS_2, WS_2, mica and talc combinations thereof, and 50 weight % to 5 weight % of an organic binder selected from the group consisting of dispersed polytetrafluoroethylene (TFE) and starch.

10. Packing as claimed in claim 9, wherein said inorganic lubricant is graphite, and said inorganic binder is dispersed TFE.

11. Packing as claimed in claims 9 or 10, wherein the content of said inorganic lubricant in said impregnant is from 60 to 90 weight % and of said organic binder is from 10 to 40 weight %.

12. Packing as claimed in claim 9, wherein said vitreous fiber is selected from the group consisting of electrical-grade glass fiber, structural-grade glass fiber, chemical-grade glass fiber, ceramic fiber and quartz fiber.

13. Packing comprising a core of an inexpensive organic fiber, a first braided sleeve of vitreous fiber over said core and an impregnant consisting of from 50 to 95 weight % of dispersed material selected from the group consisting of graphite, MoS, TiS, WS, talc and mica and from 5 to 50 weight % of a dispersed polytetrafluoroethylene or starch said vitreous fiber being selected from the group consisting of chemical, structural and electrical grade glass fiber, quartz fiber and ceramic fiber, said organic fiber is selected from the group consisting of jute, flax, hemp, cotton ramie, nylon, rayon, polyethylene and polypropylene.

14. Packing as claimed in claim 13, further comprising a braided second sleeve or organic fiber over said first braided sleeve of vitreous fiber, said organic fiber of second sleeve being selected from the group consisting of plytetrafluoroethylene, aramid, graphite and carbon fibers.

15. Packing comprising of a core of an inexpensive organic fiber and a braided sleeve over said core, said organic fiber being selected from the group consisting of jute, flax, hemp, cotton, ramie, nylon, rayon, polyethylene and polypropylene, said braided sleeve being formed of strands each consisting of vitreous and aramid fibers laid up, twisted or spun together, the content of aramid fiber being from 2 to 50 weight %.

16. Packing as claimed in claim 15, wherein said packing further comprises a lubricant selected from the group consisting of graphite, MoS_2, WS_2, TiS_2, talc and mica and a binder consisting of dispersed polytetrafluoroethylene or starch.

17. Packing as claimed in claim 16, wherein the weight ratio of said binder to said lubricant lies between 5:95 and 50:50.

18. Gasket material, comprising a braided sleeve of organic and vitreous fiber, said organic fiber providing the major portion of the conformability of said gasket and said vitreous fiber reinforcing said gasket against internal pressure, sleeve being impregnated with a member of the group consisting of dispersed polytetrafluoroethylene (TFE), or starch.

19. Gasket material as claimed in claim 18, wherein said organic fiber is polytetrafluoroethylene fiber, aramid fiber, polyethylene fiber, polypropylene fiber or nylon fiber, and said vitreous fiber is electrical, chemical or structural glass fiber.

20. Gasket material as claimed in claim 18, wherein said sleeve comprises a braided base sleeve of vitreous fiber and an outer sleeve of organic fiber over said base sleeve, said impregnant being in all sleeves.

21. Gasket material as claimed in claim 22, further comprising an inner sleeve or organic fiber within said base sleeve of vitreous fiber, said impregnant being in all sleeves.

22. Gasket material as claimed in claim 18, 19 or 20, wherein said sleeve comprises strands, each of said strands comprising vitreous and organic fibers twisted or spun or laid up together.

23. Gasket material as claimed in claim 18, wherein the weight ratio of vitreous fiber to organic fiber in said sleeve lies between 5:95 and 95:5.

24. Gasket material as claimed in claim 18, wherein said sleeve comprises strands of inorganic and organic fibers twisted, spun or laid up together.

25. Gasket material as claimed in claim 18, wherein said sleeve comprises strands of inorganic fiber alone and strands of organic fiber alone.

26. Packing material substantially as hereinbefore described with reference to the accompanying drawings.

27. Gasket material substantially as hereinbefore described with reference to the accompanying drawings.

CLAIMS

Amendments to the claims have been filed, and have the following effect:–

Claims 1–27 above have been deleted or textually amended.

New or textually amended claims have been

filed as follows:–

1. A packing comprising braided strands of a first vitreous fibre and a second fibre in combination, said first vitreous fibre being selected from the group consisting of electrical-grade glass, structural-grade glass, chemical-grade glass, ceramic and quartz fibres, said second fibre being selected from the group consisting of organic fibres of polytetrafluoroethylene (TFE), polythylene, polypropylene, aramid nylon, rayon, flax, ramie, hemp, jute and cotton and carbon and graphite fibres, the content of the first vitreous fibre in the combination being from 5 to 95 weight percent.

2. A packing according to claim 1, wherein the first vitreous fibre content is from 45 to 95 weight percent.

3. A packing according to claim 2, wherein the first vitreous fibre content is from 65 to 90 weight percent.

4. A packing according to any preceding claim, wherein the strands of said first vitreous fibre and at least one of the organic, carbon or graphite fibres are spun together.

5. A packing according to any one of claims 1 to 3 wherein the strands of said first vitreous fibre and at least one of the organic, carbon or graphite fibres are spun together.

6. A packing according to any one of claims 1 to 3, wherein the strands of said first vitreous fibre and at least one of the organic, carbon or graphite fibres are laid-up together.

7. A packing according to any one of claims 1 to 3, wherein the strands of said first vitreous fibre and at least one of the organic, carbon or graphite fibres are braided together.

8. A packing according to any preceding claim, further including an impregnant comprising an inorganic lubricant selected from the group consisting of dispersed graphite, MoS_2, TiS_2, WS_2, talc and combinations thereof.

9. A packing according to claim 8, further including a binder selected from the group of dispersed polytetrafluoroethylene and starch.

10. A packing according to claim 8, wherein the content of the graphite in the impregnant is from 50 to 95 weight percent.

11. A packing according to claim 10, wherein the content of graphite in the impregnant is from 60 to 90 weight percent.

12. A packing according to any one of claims 1, 2, 3, 4, 5, 6 or 7, further including an impregnant consisting essentially of from 0 to 100 percent dispersed polytetrafluoroethylene, with any remainder being dispersed graphite.

13. A packing according to claim 12, wherein the content of the dispersed polytetrafluoroethylene in the impregnant is from 5 to 95 weight percent.

14. A packing according to claim 1, wherein the vitreous fibre is a glass fibre which has been texturized for increasing the bulk volume thereof.

15. A packing according to claim 1, further including a core of an inexpensive organic fibre and a braided jacket of said vitreous fibre in combination with at least one of said organic fibres and carbon and graphite fibres.

16. A packing according to claim 15, wherein the jacket includes from 2 to 50 weight percent of at least one of said organic fibres and carbon and graphite fibres.

17. A packing according to claim 15, further including an impregnant selected from the group of lubricants consisting of graphite, MoS_2, TiS_2, WS_2 and talc in a binder selected from the group consisting of dispersed polytetrafluoroethylene and starch.

18. A packing according to claim 17, wherein the weight ratio of said binder to said lubricant lies between 5:95 to 50:50.

19. A packing according to claim 17, whereinthe weight ratio of said binder to said lubricant is from 10:90 to 90:10.

20. A packing according to claim 17, wherein the weight ratio of said binder to said lubricant is from 20:80 to 80:20.

21. A packing according to claim 17, wherein the weight ratio of said binder to said lubricant is from 40:60 to 90:10.

22. A packing comprising knitted strands of a first vitreous fibre twisted together with at least one of an organic fibre, carbon or graphite and an impregnant comprising an inorganic lubricant selected from the group consisting of dispersed graphite, MoS_2, TiS_2, WS_2 and talc.

23. A packing comprising knitted strands of inorganic fibre twisted together with at least one of an organic fibre, carbon or graphite and an organic binder selected from the group consisting of polytetrafluoroethylene and starch.

24. A packing comprising a first layer of knitted first vitreous fibre and a second layer comprising at least one of an organic fibre, carbon or graphite, the second fibre in said second layer being present in sufficient quantities to provide protection for said vitreous fibre from abrasion.

25. A packing according to claim 24, wherein the second layer is knitted.

26. A packing according to claim 24, wherein the second layer is braided.

27. A packing according to claim 24, wherein the second fibre in the second layer further includes a vitreous fibre.

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